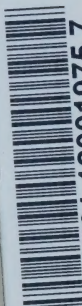
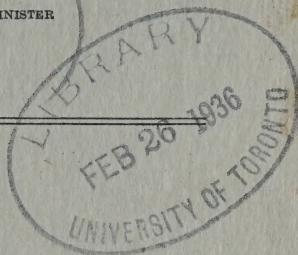


Canada: Mines, Bureau of Explosives  
" Division



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CANADA  
DEPARTMENT OF MINES  
HON. W. A. GORDON, MINISTER; CHARLES CAMSELL, DEPUTY MINISTER  
**EXPLOSIVES DIVISION**  
LT.-COL. G. OGILVIE, CHIEF INSPECTOR



ANNUAL REPORT

OF THE

**EXPLOSIVES DIVISION**

OF THE

**DEPARTMENT OF MINES**

FOR THE CALENDAR YEAR

**1933**



OTTAWA  
J. O. PATENAUDE  
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY  
1934

No. 35





CANADA  
DEPARTMENT OF MINES  
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# **ANNUAL REPORT OF THE EXPLOSIVES DIVISION OF THE DEPARTMENT OF MINES**

**FOR THE CALENDAR YEAR 1933**

**BY**

**Lt.-Col. G. Ogilvie, C.M.G.**

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The following report deals with the administration of the Explosives Act during the year ending December 31, 1933.

## **MANUFACTURE OF EXPLOSIVES**

There is no change to record in the list of 10 licensed factories, which is given in Appendix A. With the exception of the factory of the North Star Explosives Company at Prescott, all continued in operation.

Inspectors of the Division made 28 inspections of factories, and one additional was made by a Deputy Inspector of the Royal Canadian Mounted Police. The regulations and terms of licence were generally well observed.

Several proposals for changes in the appropriation of buildings, to meet altering requirements of the trade, or changes in manufacturing processes, were examined on the occasions of these inspections, and, as approved, embodied in the licences.

The total output of the several classes of explosives is shown in Appendix B, and it is of interest to note that the production of high explosives and black powders, which had been steadily falling since 1929, this year reflected the upward trend in mining activity and totalled approximately 17,973 tons, being an increase of over 11 per cent on the production of 1932.

## **ACCIDENTS IN MANUFACTURE**

Two disastrous explosions, attended by loss of life, occurred in a licensed factory, that of the Canadian Industries Limited at Beloeil, Que.

The first was an explosion in the black powder press house, at 3.29 p.m. on March 30, by which the two operators in the building, Messrs. William Bradley and Herve Trudeau, were instantly killed. They were experienced and trusted operators. Bradley had been in the service of the Company for 16 years of which 8 had been spent in the black powder line, and Trudeau had 11 years service, including 10 in the black powder line. It was established from the evidence that a finished charge of about 2,500 pounds of broken press cake had been loaded into the truck ready

for removal to the corning mill, and that the men were engaged at some stage of the operations of cleaning up the spillings, or preparing the press for reception of the next charge. The black powder superintendent had visited the building eight minutes before the explosion, and from his observation then, and knowledge of the routine followed, a reasonable deduction is that the aluminium plates, stacked on a table alongside the press when removed in the unloading of the previous charge, were being replaced. In doing so it is possible that, owing to some overlooked adhering powder in the press, a plate did not fit into place and necessitated scraping off the powder—done with a small bronze “spud” after thoroughly soaking the powder. One plate, probably in the press at the time of explosion, was picked up in a direction consistent with the throw of the press itself, which had been torn from its foundation and turned through a quarter of a circle by the explosion of the powder cake in the truck. The other plates lay in a different direction and not very widely scattered. From the position of the remains of the men it appeared that, when the explosion occurred, they had been near to the end of the press, and one of them between that and the doorway. Some action connected with the removal of adhering powder, as suggested, would seem to furnish the most probable cause in the sequence of operations and be consistent with their estimated stage, but, as at about this period one of the men may have been disengaged and occupied himself in cleaning up or putting in order something else in the house which caught his eye as requiring attention, it is always possible, although not so probable, that the explosion was brought about by inadvertent action of a character which could not be conjectured.

Inclusive of the truck load there were 6,500 pounds of powder in the building. The building was demolished and the barricades destroyed. The great bulk of the debris lay within a radius of 100 yards. It was noticeable that heavy debris was thrown farther to a side on which the protection afforded by the barricade was less than on the others, owing to its greater distance from the building proper, necessitated by an extension for housing the ram of the press on that side. Advantage was taken of the opportunity given by reconstruction to alter the position of the breakdown rolls to one offering greater convenience, to give sure stability to the table with aluminium plates, and to face the head of the press box and of the ram with aluminium. A lignum vitae spud replaced the bronze one, and a catch-box was provided under the ram end of the press box, so that any black powder pushed back by the returning ram would be caught, and not dropped into the pit beneath the ram.

Unfortunately the material damage caused was not limited to the loss of the press house, as the explosion there was followed by one in the corning mill, distant 175 yards, and barricaded except on the far side in front of which there were no buildings. Only one piece of any consequence, and which might have been from the press house, was found near the corning mill, but the explosion in the corning mill occurred just when debris from the press mill was falling near an observer at an equal distance, and it is considered most probable that a stray piece, falling through the roof, initiated explosion. Alternatively the concussion of the first explosion may have thrown the mill, then running, out of true, but in this case a further appreciable lapse of time might have been expected while seized bearings



heated. The possibility of a nut or some mill part being dislodged, and falling, was considered, but initiation of explosion by falling debris from the press house is believed to be the most probable cause. As the corning mill was running no one was present in the building. About 3,200 pounds of powder were involved in this explosion. The debris lay within 100 yards radius on the barricaded sides and on the open side mostly within 150 yards, with a few pieces ranging up to about 250 yards.

The other fatal explosion occurred in a nitrator house at 1.20 p.m. on July 19, taking the lives of the three men in the building at the time, namely, Messrs. Charles Morrish, O.B.E., nitroglycerine foreman, William O'Brien, separator operator, and Harry Eastwick, outside operator. Morrish and O'Brien had been in the service of the company for 23 and 11 years respectively, spent almost entirely in the nitroglycerine line, while Eastwick had over 19 years service of which 13 had been as "outside operator." Another employee was cut in the head by broken glass when in the cordite-reeling room, 250 yards distant.

The arrangement of the equipment in the building was the usual one, with the nitrator on the highest floor or stage at the back of the building, the separator on the stage below and in front of that, and the pre-wash and drowning-tanks below that again, flow being by gravity from nitrator to separator, from either in case of need to drowning-tank, and from separator to pre-wash tank. Waste acids were also run, by gravity, from the separator to a blow case, just outside the barricade, for transmission to the acid recovery plant.

A second explosion followed three minutes after the first, as assessed by timing several men while they repeated their actions of the interval between explosions. Investigation showed clearly that the first explosion had been that of the charge (3,000 pounds) in the pre-wash tank, that that explosion wrecked the building, practically destroyed the barricades, and that the nitrator crashed to the ground where its charge (2,700 to 2,800 pounds), out of control, shortly exploded.

The situation a few minutes before the first explosion may be pictured as: Morrish attending to the nitrator containing the sixth charge of the day, nitration of which had commenced at 12.34 p.m. and which, normally, would have been completed at 1.40 p.m.; Eastwick probably on the nitrator floor, whither he would have come in the course of his duties relating to the supply of acid to the house and to the drawing of waste acids therefrom, while O'Brien on the separator floor had completed running a charge to the pre-wash tank and had commenced running the waste acid to the blow case, in which a quantity of about 300 pounds was found after the explosion.

At this stage O'Brien was called to the top floor to answer a telephone call—it not being permitted for Morrish to leave the nitrator unless relieved. O'Brien presumably then stopped the flow of the waste acid temporarily, and Eastwick took his place on the separator floor. The telephone call being for Morrish, O'Brien then relieved Morrish at the nitrator while the latter answered it. A short telephone conversation followed which is reported to have ended rather abruptly, although not with any indication of alarm. It may have been that Morrish had just noticed fumes; it is doubtful, but if so it was too late, for the explosion followed immediately on completion of the conversation. Morrish appeared to have been caught



by the explosion as he was passing the open door. His body, intact, was picked up at about 25 yards from the building. O'Brien had been decapitated and had had his right arm blown off. Except for head and arm his body would have been protected by the nitrator from explosion at the pre-wash tank. His remains were found at about 60 yards from the building. Eastwick had been undoubtedly close to the seat of explosion. After a charge had been passed to the pre-wash tank the regular procedure was to turn off the air agitation—which, during filling, had been on at a pressure of five pounds—for a minute or so, and then to turn it on, at a slightly reduced pressure, for 5 minutes. It is computed that the explosion occurred four minutes after the charge had been passed to the pre-wash and in this case, in all probability, there had been no agitation during that period. There was also reason to suspect that the operators were apt to place more reliance on visual observation of the agitation than on gauge reading, and that the agitation given during the period of filling may have been less than was desirable. The outlet of the tank, which was of a design commonly used, was at the bottom of the tank wall, that is, not in the bottom of the tank itself, and so formed a small "cul de sac" in which full benefit of whatever agitation was given might not be felt.

Insufficient agitation would undoubtedly be a contributory cause of spontaneous decomposition, but it may be contended that, except for the believed omission of agitation for the brief final period, the agitation given was in accordance with recent successful practice. Another possible contributory cause would be carrying over too much acid with the nitroglycerine to the pre-wash tank, as would happen were the separation incomplete. In this case the time of separation was found to be thirty-five minutes. Forty minutes is desirable, but with the separation as had been given the recovery of nitroglycerine from the waste acids had been only of the customary very small quantities, and in fact a couple of weeks previously the assistant superintendent had had occasion to check the operators for allowing rather less time than that for separation. Incomplete separation followed by inadequate agitation in the pre-wash tank would give rise to a condition conducive to spontaneous decomposition, but the cleanness of separation could scarcely have fallen markedly short of the desired standard without indication, of which there was none, in the routine treatment of the waste acids.

It is hardly possible to estimate to what extent the agitation may have fallen, gradually and imperceptibly, but it is reasonable to believe that it may have so fallen as to have been insufficient to cope with the reaction of the acids which passed over with the nitroglycerine. It is always conceivable that a slip or fall of one of the men may have led to some other mischance which was the means of initiating explosion, as for example had Eastwick proceeded to empty some nitroglycerine, recovered from the settling-tank, into the pre-wash tank and had stumbled when bending over the tank to do so. There is absolutely no evidence in support of such a theory, but consideration of the possibility, remote although it may appear, of such an accident has led to a rearrangement of the gutters whereby recovered nitroglycerine may be poured with ease into the gutter instead of directly to the tank.

As the first explosion wrecked the barricades the second explosion took place in a virtually unbarricaded building, in consequence of which debris



was scattered over a circle of 300 yards radius. Also, as the nitrator fell to below the level of the low concrete walls, forming part of the foundations, large pieces of concrete were thrown in all directions, a few to a distance of slightly over 400 yards. Fortunately no other employee, except the one who had received cuts from broken glass, was injured.

In rebuilding, piers have been substituted for walls in the foundations and opportunity taken to so alter the arrangement of equipment as to add to the convenience of working. New gauges have been obtained giving clearer readings, the pre-wash tank is of the design with outlet in the bottom, and the use of the telephone has been restricted to what is strictly essential to the control of operations.

A non-fatal accident occurred at the James Island factory of the Canadian Industries Limited whereby an employee sustained burns when engaged in destroying danger building refuse at the burning-out grounds.

A report was also obtained of a fatal accident which occurred in the course of experimental manufacture of an explosive, not in a licensed factory. The victim was Mr. Carlton W. Berry who, with an assistant, Mr. A. A. MacSween, was preparing a chlorate explosive, Bermite, at Waterloo, Que., on October 2. It appeared that Mr. Berry had occasion to repair a sieve and, in doing so, endeavoured to straighten a bent nail by striking it with an iron bar. A resulting spark ignited the mixture on the bench and fire instantly spread to all the explosive. Mr. Berry, who wore cotton overalls, received severe burns on the body, as well as on face and hands, and succumbed to his injuries the following day. Mr. MacSween was better protected in a heavy cloth suit and, although badly burned, about face and hands, recovered.

### MAGAZINES

The number of magazines under licence at the end of the year was 343, a decrease of 6, and the number of temporary magazine licences issued during the year again showed a decrease, being 168, or 27 fewer than in 1932.

A difficulty often experienced in the early years of application of the regulations was in bringing owners of permanent magazines to realize that instructions relating to the good maintenance of the buildings, and to the proper care of the explosives, however vexatious they may have seemed, had a direct bearing on the safe keeping and good condition of the explosives. In recent years the attitude has been very different. Such faults as have been observed were usually of a minor character, speedily rectified, and licensees have also welcomed recommendation for improvement in their magazines. In the result there has been a steady increase in the number of magazines of the more substantial types. The amount of explosives found on inspection to be unserviceable, through long keeping or exposure, and condemned, shows a considerable decrease. Three main lots of 1,350, 700, and 450 pounds, also 907 pounds distributed over 14 other magazines were so condemned. With the exception of the lot of 1,350 pounds, which has been held for destruction in the Spring, all have been destroyed.

Magazines in outlying districts and temporary magazines are usually of log or double-frame construction, and while licensees of temporary

magazines are more liable to change than are the dealers with permanent magazines, yet with many it is more a case of change in the location of operations than of personnel, and, with the valued co-operation given by Provincial government departments through which information is obtained of the locale of new undertakings, and of the Royal Canadian Mounted Police in obtaining contact with users of explosives, the inspection of these magazines has been considerably facilitated.

Reference was made in the last report to the establishment of magazines in the Great Bear Lake mining district. These have increased in number and capacity, and, from reports received from deputy inspectors of the Dominion Lands Branch, Department of Interior, and the Royal Canadian Mounted Police, have been well located, built and supervised.

Inspectors of the Division made 361 visits of inspection to magazines and 260 were made by deputy inspectors. In addition, satisfactory reports were received on the inspection of two outlying magazines from the Commissioner of the British Columbia Provincial Police, and on four inspections of magazines in Arctic and sub-Arctic regions made by the Royal Canadian Mounted Police in 1932, but which could not be transmitted until the following year.

#### **THEFTS FROM MAGAZINES**

Explosives stolen from magazines amounted to less than forty per cent of the quantity taken in either of the two preceding years, but there is no diminution in the number of magazines forcibly entered for the purpose of theft. Eighteen magazines were broken into, one on three occasions and two twice. In seven instances the quantity taken was in excess of 100 pounds and, in all, there were stolen 1,932 pounds of dynamite, 30 quarts of nitroglycerine, 5,072 detonators, and 5,628 feet of safety fuse; 400 pounds of dynamite were recovered.

As has been previously pointed out the strongest magazine cannot be regarded as proof against forcible entry; it does offer difficulty and consequent delay with added risk of detection, particularly where the magazine is under reasonably close supervision or subject to frequent and irregular visits by the man in charge. In the last report increased supervision of this character was urged in the case of magazines established near road or other construction camps, where it was easy of application. This year only one such magazine was entered.

When there is any considerable lapse of time between the commitment of a theft and its discovery the difficulty in tracing the thief, at all times great, is clearly intensified. In one case, however, the Provincial government authorities concerned obtained conviction against two men for breaking and entering a magazine. They were sentenced to periods of two and five years' imprisonment.

#### **EXPLOSIVES FOUND**

The explosives found were limited to small quantities amounting in all to 84 pounds of dynamite, 82 detonators, and 19 feet of safety fuse distributed over 15 places. This does not take account of the explosives, referred to as having been found, in the brief descriptions of accidents



arising from playing with explosives given in Appendix D. Indeed, what the small boy states to have been found has not necessarily been truly lost although it certainly has not been properly kept. Some of the findings here recorded pointed to this fault, as in the case of 9 dynamite cartridges found in a garage by an incoming tenant, a like quantity cached in a stump, or 7 cartridges found by boys in an old quarry and handed over to the police. The finding of detonators on the roadside or canal bank, where work had been in progress previously, certainly suggests that they had been forgotten by workers, but small packets of explosive picked up in a garden hedge, or inside a pipe in an engineering yard, or inserted from the outside of an old barn in a bale of hay within, and not in such a way as indicate the slightest intention of causing an explosion, points rather to the owners having taken the most convenient ways offered of getting rid of the explosives, with complete disregard of what might happen to anyone else. A school window sill is a far from fitting repository for explosives, yet a dynamite cartridge was retrieved from one. Twenty-six pounds of dynamite were found cached in a boat house by the tenant and identified as explosives stolen from a contractor in the vicinity. In two cases explosives were found in private houses in the course of police search in other connections. In both cases the occupiers were charged under the Criminal Code, by Provincial authorities, with being in unlawful possession of explosives, convicted and sentenced to terms of imprisonment.

The fact that no forgotten caches of explosives, in any appreciable quantity, were uncovered, gives ground for the hope that this danger has been largely overcome by dint of the activity of the Royal Canadian Mounted Police in the past years in tracing and disposing of old caches, and by the growth of better realization on the part of users of explosives of their responsibility for the safe keeping of their explosives.

### UNLICENSED PREMISES

There has always been apparent a tendency on the part of some dealers to assume that the lapse of any considerable period between inspections was a sign that the regulations relating to the storage of small quantities of explosives, and the keeping of records of their transactions, no longer applied.

It has not been practicable hitherto, having regard to the personnel available and the necessary exercise of every economy, to provide for routine inspections of a frequency which would eliminate the chance of any slackening in observance of the regulations, but, as was anticipated in the last report, the increase in the number of detachments of the Royal Canadian Mounted Police has resulted in a marked increase in the inspection work done, without added expense to the public. Over 3,000 inspection visits to unlicensed premises were so made, additional to 678 made by inspectors of the Division.

The valuable service so rendered, in addition to checking the tendency referred to above, and to getting earlier in touch with new dealers, has also undoubtedly served to minimize the dangers to be apprehended from careless keeping and handling of explosives by some who, not requiring such quantities as would necessitate the provision of a licensed magazine,

are subject to the same regulations as the merchant carrying small stocks, but with whom it is very much more difficult to obtain contact.

Three thefts from work parties were reported, totalling 226 pounds of dynamite, 200 detonators and 75 feet of fuse. In one case the thieves were traced and convicted and part of the stolen explosives recovered. From two detached stores, other than used in connection with construction parties, 100 pounds of dynamite and 278 detonators were stolen. Thirty pounds of dynamite taken from two other stores were recovered. Two cases (100 pounds) of explosives were also stolen from a sleigh in transportation.

Neglect to observe the regulations requiring that fireworks, laid out for display in a store, shall be "protected from the direct action of the sun's rays" led to the explosion of fireworks in a store window with resultant damage estimated at \$2,200. In another case such protection from direct action of the sun's rays, as may have been given, had been circumvented by a mirror in the hands of a boy.

### IMPORTATIONS

A statement of the explosives imported during the year is given in Appendix C. These importations were made under the authority of 423 permits and 33 special permits. The importations of blasting explosives, as black powder and dynamite, do not bulk largely, but there are considerable importations of propellant powders for use in the manufacture of sporting cartridges, of explosives for use in explosive factories, and particularly of nitrocotton required in the manufacture of lacquers. As might be expected during a period necessarily marked by the practice of economy, the quantity of fireworks imported dropped nearly 28 per cent, approximating to the fall of about 30 per cent in domestic manufacture. Of the imported fireworks nearly 80 per cent were Chinese fireworks. About 13 per cent of the Chinese fireworks presented for importation was rejected. Several of these rejections were on account of the use of unauthorized compositions, but the quantities so affected were small. Indeed this trouble, once the outstanding one found with Chinese firecrackers, would appear to have been very largely overcome. The increase in rejections this year is attributable to the refusal of entry of a few larger consignments found to contain firecrackers with fuses of very variable times of burning involving danger in use, and to others which, by reason of smouldering debris, and debris bursting into flame, presented a real fire hazard.

### AUTHORIZATION OF EXPLOSIVES

Only one new high explosive—Monobel No. 14—has been added to the authorized list but, with a view to simplification of nomenclature, the rather cumbrous although descriptive names of some of the dynamite series have been dropped in favour of shorter ones, thus Polar Ammonia Dynamite becomes "Polar Stopeite," Polar Dynamite Mining, "Polar Mineite," and Polar Forceite Gelatin Diamond, "Giant Gelatin." Several relatively minor changes in formulae were authorized, but the series remain essentially as before. Examinations were made of 38 samples covering these changes and in checking the run of work. Five high explosives presented for authorization were refused after examination. One new



brand of safety fuse, the "Shamrock" brand, was authorized. Examination was made also of 207 samples of fireworks, including 131 examined by the Dominion Analyst at Vancouver. These were, for the most part, check examinations of fireworks presented for importation, but included also examination of 32 new varieties of which 22 were authorized and 10 rejected. Of the 175 samples selected from shipments of imported fireworks 157 were found satisfactory and the shipments, or part shipments, represented by the others refused entry.

### PROSECUTIONS

Proceedings were taken against a magazine owner who operated his magazine without a licence. He was fined \$25 with the alternative of one month's imprisonment.

### ACCIDENTS

It is seldom that any serious accident in the conveyance of explosives has to be recorded, but the most disastrous of all this year was the explosion of about 50 dynamite cartridges in a boat conveying a party of thirteen lumbermen across a lake from camp to place of work. Some of the cartridges had been primed before starting, additional detonators had also been taken, and apparently some further priming of cartridges had been in progress on the trip across the lake. The precise cause of the explosion cannot be definitely given, but it was stated at the inquest that, when approaching the shore, one of the deceased stood up in the boat and accidentally dropped a detonator, the explosion following immediately. In any event the carrying of exposed detonators and dynamite in a boat load of men was the primary cause of this disaster which took the lives of seven men, and severely injured another. Samples of the explosives taken from the same stock held at the camp were examined and found in good condition.

The number of casualties directly connected with the use of explosives showed a decrease, being 19 killed and 90 injured, as compared with 22 killed and 152 injured in 1932. The number of injured here given for the year 1932 includes seven slightly gassed in a mine, and one struck by projected debris in a mine, reports on which accidents were not received in time for inclusion in last Annual Report.

This reduction in accidents is in keeping with the trend observed during the last two or three years. It is also, when considered over a period of years, more noticeable in the case of fatal accidents than others, and as the chance of fatal accidents escaping notice is small, and endeavour has continually been made to obtain as complete a record of all accidents as possible, it is probable that the more marked decrease in killed than in injured is, in part at least, attributable to more complete records being obtained of the less serious accidents. The consumption of explosives has been relatively low in recent years but, making due allowance for this, the frequency of accidents has been, distinctly, lessening.

Nevertheless a scrutiny of the attributed causes of accidents in the use of explosives as summarized in Appendix D, brings the reflection that many of the accidents are avoidable. The causes "prematures and failing to get away from the shot hole" and "hangfires and returning too soon"

always bulk largely. True prematures and hangfires are practically unknown. What these causes cover in the main are, the use of short fuse, delaying over the shot hole owing to difficulty in lighting the fuse, or, in doubt if it had been lit, misjudging the time while waiting for a shot to fire and returning assuming it to have misfired (although even a misfired shot should not be so approached immediately), or, when firing several shots, miscounting the number actually fired. Accidents classed as due to "not taking proper cover" are clearly indicative of failure to take reasonable precaution, and to these should probably be added a number of those shown as caused by "projected debris," since in this category are placed accidents on which no information is available on the precautions taken.

With the exception of the accidents in use classed as "various" the attributed causes are sufficiently indicated by the descriptive sub-heads, but it may be of interest to note that an accident, due to "sparks," whereby one man was killed and one injured, was brought about by a man opening a canister of black powder with a cold chisel, and that the spark which ignited the powder was seen by a witness.

Some interest attaches to a few of the "various" accidents. In one a miner used a carbide tin as receptacle for a stick of Monobel, a few detonators, and a coil of fuse. He had an open pit lamp and when he opened the tin, acetylene gas which had been generated, flashed. He was fortunate in being able to smother the flame without more serious injury to himself than burns about the face and hands.

Another miner who kept detonators and carbide in one tin had his hand lacerated by the explosion of the detonators, which occurred on opening the tin.

A miner, with a detonator in his hand, slipped from a muck car and accidentally struck the detonator on the side of the car. He lost a thumb and two fingers by the explosion.

While attempting to push a charge in place to blast a "hung" chute, the ore caved and fired the charge, causing loss of an eye and other injuries to the shotfirer.

Brief notes on the circumstances, so far as ascertained, attending accidents arising from playing with explosives, also of those due to various causes not connected with either playing with explosives, or their use, are given in the Appendix.

Playing with explosives was accountable for injuries suffered by 45 persons which, except that no lives were lost, does not show an improvement on the toll taken in the previous year, when 3 were killed and 42 injured. To a large extent these accidents are made possible by the improper keeping of explosives, particularly detonators, in private houses and, as may be seen from these records, beams in cellars and barns, and the like are, unfortunately, still regarded as suitable repositories for explosives.

The small boy might well be better protected by his elders from a temptation to play with such dangerous toys, which is a very understandable one. It is certainly more so than is the folly of youths of about 17 years of age who, sitting round a table in a dwelling house, set to work extracting the composition from a number of detonators, with the result that 10 persons were injured.



Miscellaneous accidents, other than brought about in playing with explosives, caused the death of four persons and injury to four others. The first of those detailed in the Appendix whereby a farmer was killed, disclosed the keeping of three sticks of stumping powder on a shelf or beam over a stove, and this, like the keeping of powder in a baking powder tin on a kitchen shelf—setting the stage for one of the accidents in “playing with other explosives”—suggests an even greater lack of appreciation of the dangers invited by careless keeping of explosives than that indicated by caching them in a cellar or barn.

### GENERAL

The mining development in the Great Bear Lake region, in addition to calling for the exercise of supervision over the establishment and maintenance of magazines for explosives, gave rise to more difficult questions relating to the safe transportation of explosives down the Mackenzie River and across Great Bear Lake. The multiplicity of stores, which had to be carried by the transportation companies in the short navigation season and with the facilities available, necessitated the consideration of much detail in regard to the places and manner of stowage in barges, as well as the handling and disposal of the explosives at portages and points of call. While this involved the imposition of many restrictions on the transportation companies, it is to the cordial co-operation given by them and to the helpful supervision exercised by the detachments of the Royal Canadian Mounted Police that must be attributed the gratifying record of orderly and safe conveyance of thirty-three tons of dynamite and 55,000 detonators, through several transshipments, in the long journey to destination.

### APPENDIX A

#### Factories Licensed to Manufacture Explosives in 1933

Owner	Location of factory	General nature of product	Remarks
Canadian Industries, Ltd.....	Beloeil, P.Q.....	Blasting explosives, black powders, propellants.	
Canadian Industries, Ltd.....	James Island, B.C..	Blasting explosives, black powders.	
Canadian Industries, Ltd.....	Nobel, Ont.....	Blasting explosives.	
Canadian Industries, Ltd.....	Brownsburg, P.Q....	Ammunition, detonators, etc.	
North Star Explosives Co., Ltd.	Prescott, Ont.....	Fulminate of mercury...	Not in operation.
Canadian Safety Fuse Co.....	Brownsburg, P.Q....	Safety fuse.	
T. W. Hand Fireworks Co., Ltd.	Dixie, Ont.....	Fireworks.	
Toronto Fireworks Co., Ltd..	Islington, Ont.....	Fireworks.	
B. Marroni.....	Ville St. Pierre, P.Q.	Fireworks.....	Operation intermittent.
Macdonald Metal Products Co., Ltd.	Waterloo, P.Q.....	Toy pistol caps.	

## APPENDIX B

## Production of Explosives in Canadian Factories during the year 1933

	Quantity
Class I. Gunpowder.....	275,453 lb.
" II. Nitrate mixtures.....	833,275 "
" III. Nitro-compounds—	
Division 1.....	34,836,827 "
" V. Fulminates—	
Division 1.....	Output of one factory.
" VI. *Ammunition—	
Division 1—	
Safety cartridges.....	131,180,463
Safety fuse.....	Output of one factory.
Railway torpedoes.....	Output of one factory.
Percussion caps.....	Output of one factory.
Division 3—	
Detonators and electric detonators.....	Output of one factory.
" VII. Fireworks—	
Division 2.....	(approx. value) \$80,000

\* Exclusive of artillery ammunition but includes small arms ammunition made in Government factories.

## APPENDIX C

## Explosives Imported into Canada, January 1 to December 31, 1933

Class	Division	Description	Quantity
II		Nitrate mixtures.....	590 lb.
III	1	Mixtures containing liquid nitro-compounds.....	22,936 "
	2	Nitro-compounds:—	
		(a) Propellants.....	125,057 "
		(b) For use in explosives factories.....	198,334 "
		(c) For other manufacturing purposes.....	756,320 "
VI	1	Percussion caps.....	393,000
		Safety fuse.....	153,100 feet
	2	Miners' squibs.....	111,100
		Detonating fuse.....	95,508 feet
	3	Detonators and electric detonators.....	6,100
VII	2	Manufactured fireworks.....	244,000 lb. (approx.)



# **APPENDIX D** **Accidents from Explosives during the Calendar Year 1933**

Circumstances or Cause	In Mines and Quarries			Elsewhere			Total		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
I. Manufacture*									
II. Keeping.....				4	6	3	4	6	3
III. Conveyance (other than by railway).....				1	7	1	1	7	1
Total, Manufacture, Keeping, Conveyance.....				5††	13	4	5	13	4
IV. Use and Miscellaneous—									
Shot Firing—									
(a) Prematures, and failing to get away from shot hole.....	11	1	12	6	3	4	17	4	16
(b) Firing by electricity when persons are at the shot hole.....									
(c) Not taking proper cover.....	8	2	8	2	1	1	10	3	9
(d) Projected debris.....	6		6	9		10	15		16
(e) Hangfires, and returning too soon to shot hole.....									
(f) Tampering with misfired shots.....	6	2	4	8	2	6	14	4	10
(g) Ramming or stemming the charge.....	2		3	1		1	3		4
(h) Sparks, flame, etc.....	2		2	1		2	3		4
(i) Boring into unexploded charges.....				2	2	1	2	2	1
(j) Striking unexploded charges in re-moving debris.....	2		2						2
(k) Preparing charges.....	1		2	1		1	2		3
(m) Fumes.....	1		1	2		2	3		3
(n) Socketing or springing shots.....	4	1	5				4		5
(o) Various.....	1		1	2		2	3		3
† Miscellaneous—									
(a) Playing with detonators.....	13	5	12	2		2	15	5	14
(b) Playing with other explosives.....				18		28	18		28
(c) Various.....				10		15	10		15
Total use and miscellaneous.....	57	11	58	74	12	81	131	23	139
Total all circumstances.....	57	11	58	79	25	85	136	36	143

\*Circumstances are given in text of report.

†Circumstances are given on next page.

†† Except for these the accidents given in this table occurred in circumstances not directly controlled by the Act.

**APPENDIX D—Continued**  
**Playing with Detonators**

Cause of Accident	Killed	Injured
Boy, age 16, lost tips of three fingers of left hand by the explosion of a detonator, while he was trying to loosen the composition with a match stick.....		1
Boy applied a match to a detonator. It exploded. He lost the first joint of index finger and thumb of his right hand.....		1
Youth, age 18, found detonators and fuse in locked cellar of his employer's house. He inserted a piece of fuse in a detonator and lit the fuse. The detonator exploded. He lost the tips of thumb and forefinger of right hand.....		1
Boy placed a detonator, believed to have been received from a chum whose father retailed explosives, on a beam in a barn and struck it with a stone. It exploded tearing all the fingers of his right hand.....		1
Boy, age 13, found a rusted tin of detonators in a brick yard. While playing with the detonators they exploded. He lost the thumb and first two fingers of left hand, and his right hand was badly mutilated.....		1
Boy suffered severe injury to his left hand while playing with detonators which exploded.....		1
Boy, age 15, exploded a detonator, given him by another boy, when picking the composition with a needle. He lost thumb and two fingers of his left hand.....		1
Boys obtained detonators, which had been cached in an empty garage, and threw them on a bonfire. One boy received severe injury to an eye by flying metal.....		1
Boy, age 11, found box of detonators in chicken house. He applied a match to one of the detonators and lost the tips of three fingers of his right hand by the explosion.....		1
Boy, age 9, stole detonators from a railway work car. While picking one with a pin it exploded. He lost three fingers of left hand.....		1
Boy, age 7, took a detonator, found with others on beam in a cellar where they had been placed by the tenant, and exploded it by striking it with a stone. He lost two fingers of left hand.....		1
Boys, ages 7, 11, were given a number of detonators by the mother of one, who was ignorant of their properties. The boys attempted to cut one detonator with an electric saw. Both boys were injured about the face and hands but neither seriously.....		2
Boy, age 12, found detonator on beam of his father's cellar. While tapping the cap on a chair it exploded. He lost first joint of thumb and forefinger of left hand.....		1
Boy, age 12, staying with relatives, found a detonator on beam in barn. He struck it with a hammer and it exploded. He lost part of thumb and first finger of left hand.....		1
Boy, age 13, found detonators in a barn, near his summer home, where they had been left twenty-five years ago. While playing with them one exploded causing injuries to his right hand which necessitated amputation of two fingers.....		1
Two youths, ages about 17, were given a box of detonators by an Indian. While sitting at a table with a party of friends they started removing the composition from the caps. There was an explosion in which one youth lost the index finger of his right hand and thumb and two fingers of left hand. A second youth lost two fingers of left hand. Eight others received minor injuries.....		10
Boy, age 11, lost two fingers and thumb of his left hand when he applied a light to a detonator with which he was playing.....		1
Boy, age 14, experimenting with a detonator which he had found, had both hands severely injured when the detonator exploded.....		1
		28



## APPENDIX D—*Concluded*

### Playing with other Explosives

Cause of Accident	Killed	Injured
<i>Powders—</i>		
Two youths found gunpowder in an abandoned shack and while playing with it, near a fire, it exploded. Both were burned severely.		2
Three children, ages 11, 7, 5, found some gunpowder kept in baking powder can on kitchen shelf. They emptied the powder on the floor and dropped a lighted match on it. All received severe burns to face, chest and arms.		3
Youth, age 17, filled toy cannon with gunpowder and ignited the fuse. The powder exploded in his face causing severe burns.		1
Two men found some flashlight powder in the basement of a hall. One struck a match setting fire to the powder. Both suffered severe burns.		2
<i>Dynamite—</i>		
During Easter celebrations man, believing the fuse attached to a stick of dynamite had burned out, picked up the explosive. He lost his right hand and received severe injuries to left arm, leg, and face by the explosion which followed.		1
Boy, age 13, had the tips of three fingers of his left hand blown off by the explosion of an old stick of dynamite with which he was playing.		1
<i>Firecrackers—</i>		
Firecrackers exploded in the hands of children.		5
Direct sun's rays on store window caused ignition of firecrackers.		
Boy, reflecting sun's ray with a mirror on to firecrackers in store window, caused fire.		
		15

### Various

Cause of Accident	Killed	Injured
Farmer was killed while boiling feed for stock in a barn. It is presumed three sticks stumping powder and detonators, known to have been on a beam overhead, fell on to the stove and exploded.	1	
Man, filling a coal hod at his coal house exploded a detonator which was in the coal. He received injuries to his eyes.		1
Man was killed when dynamiting fish from a boat. On recovery of his body it was found that his right hand had been blown off.	1	
Indian, at time treaty money was being distributed, caused a can of gunpowder to explode. He was burned about face, hands and eyes.		1
Man tossed a cigar stub into a pile of detonators not knowing their nature. He received severe injuries to his hands by the explosion which followed.		1
War souvenir flare pistol was being exhibited in a church when a small boy pulled the trigger. It was loaded and a girl was burned by the ensuing flash.		1
Mining contractor exploded detonators in his pocket when they came in contact with his lighted pipe. He died of injuries.	1	
Man died from injuries received by the explosion of some detonators he had been taking to a place of storage.	1	
Man was slightly burned by an explosion which followed the lighting of his pipe. A cartridge primer was found in the bowl, and others were found in his tobacco pouch.		1
Man drilling a bullet from a rifle, caused the cartridge to explode, the casing entering his chest.		1
	4	6

## APPENDIX E

### Authorized Explosives

Explosives manufactured by Canadian firms as hereunder detailed:—

#### Burrowite Explosives Ltd.

Burrowites Nos. 1, 2, and 3.

#### Canadian Industries Ltd.

Polar Dynamite—25, 30, 35, 40, 50 and 60 per cent and 40 and 50 per cent special.

Polar Mineite—35, 40 per cent.

Polar Ammonia Dynamite—20, 25, 30, 35, 40, 50, and 60 per cent.

Polar Stopeite—20, 25, 30, 35, 40, 50, 55, and 60 per cent.

Polar Gelatinized Dynamite—50 60, and 75 per cent.

Polar Forcite Gelatin—30, 35, 40, 50, 60, 75, 80, and 90 per cent.

Giant Gelatin—30, 35, 40, 50, 60, 75, 80, and 90 per cent.

Polar Monobels, Nos. 4, 6, 7, 12, and 14.

Polar CXL-ite No. 2.

C.X.L. Special Gelatin No. 1.

C.X.L. Special Dynamite No. 1.

Polar Stumping No. 1 and Extra.

Blastol.

S.N.G.

Gypsumite "A" and "B."

Cordite.

Black blasting powders.

Black powder pellets.

Gunpowder.

Sporting powders.

Safety fuse powder.

Safety fuse lighters.

Signal bombs.

#### Canadian Safety Fuse Co., Ltd.

Safety fuse—"Clover" brand.

Safety fuse—"Black Clover" brand.

Safety fuse—"Beaver" brand.

Safety fuse—"White Jacket" brand.

Safety fuse—"Crown" brand.

Safety fuse—"Moose" brand.

Safety fuse—"Pacific" brand.

#### Dominion Cartridge Co., Ltd.

Ammunition.

Detonators.

Lead Azide.

Lead Trinitroresorcinate.

Percussion caps.

Railway torpedoes.

Electric detonators.

Railway fuses.

#### North Star Explosives Co., Ltd.

Fulminate of mercury.



APPENDIX E—*Continued***Authorized Explosives**

All explosives on the British authorized list are provisionally authorized in Canada, and in addition, those manufactured by the following firms, as detailed below:—

## Aetna Explosives Co., Inc.

Standard dynamite L.F.—15, 20, 25, 27, 30, 33, 35, 40, 45, 50, and 60 per cent.

Straight dynamite—15, 20, 25, 27, 30, 33, 35, 40, 45, 50, and 60 per cent.

Keystone standard gelatin—40, 60, and 75 per cent.

Stumping powders—20 and 30 per cent.

## American Glycerine Co.

Nitroglycerine.

## American Powder Co.

American R.C. 22 short.

## Atlas Powder Co.

Electric blasting caps, Nos. 6, 7, and 8.

Blasting caps, Nos. 6, 7, and 8.

Nitrocellulose.

Trinitrotoluene.

## Brücker and Zinke.

Safety fuse—"Globe" brand.

## Brücker and Zchetzsche.

Safety fuse—black fuse "Triumph" brand.

Safety fuse—white fuse "Triumph" brand.

## California Cap Co.

Detonators.

## Dumore National Chemical Co.

Regina stumping powder Nos. 1 and 2.

Regina rock powder Nos. 1 and 2.

## E. I. Dupont de Nemours &amp; Company, Inc.

Dupont bulk rifle powders (Nos. 80, 90, 91, 92) Rifle No. 1. Schuetzen.

Dupont smokeless shotgun powder.

Dupont pistol powders Nos. 3 and 5.

Dupont sporting rifle powders Nos. 95, 96, and 93.

Dupont military rifle powders (M.R. No. 20-23) Nos. 10, 21, 22, 30, 40, and 50.

Dupont gallery rifle powder No. 75.

Dupont Schultze smokeless shotgun powder.

Ballistite smokeless shotgun powder.

Improved military rifle powders Nos. 13, 15, 15½, 16, 17, 17½, 18, 23, 25, and 25½.

Dupont dense smokeless shotgun powder.

Fulminate of mercury.

Guncotton.

Trinitrotoluene.

Dynamite and blasting gelatin.

Agritol.

**APPENDIX E—Continued****Authorized Explosives**

Ensign-Bickford Co.

Cordeau-Bickford fuse.

Hercules Powder Co

Bullseye revolver powder.

Infallible smokeless shotgun powder.

Dynamite and blasting gelatin.

Illinois Powder Manufacturing Co.

Ammonia dynamite—40 and 60 per cent.

Powertol No. 1 and No. 3.

Independent Torpedo Co.

Nitroglycerine.

King Powder Co.

Semi-smokeless powder.

John R. Powell.

Miners' squibs.

Poudreries Reunies.

Safety fuse—"Shamrock" brand.

John R. Powell.

Miners' squibs.

Puget Sound and Alaska Powder Co.

Gelatin dynamite—25, 30, 35, 40, and 60 per cent.

Dynamite, L.F.—20, 30, 40, and 60 per cent.

Special gelatin—25, 30, 40, and 60 per cent.

Straight gelatin—25, 30, 40, and 60 per cent.

Special stumping dynamite.

Special stumping dynamite—20 and 30 per cent.

Special dynamite—40 and 60 per cent.

Straight dynamite—40 and 60 per cent.

Safety Mining Co.

Cardox.

Trojan Powder Co.

Trojan blasting CC.

Trojan TL 502.

Trojan 35 per cent standard.

Trojan 40 per cent standard.

Trojan 40C.

Trojan 50C.

United Railway Signal Corporation.

Railway torpedoes.

Western Cartridge Co.

Detonators.



## APPENDIX E—*Concluded*

### Authorized Explosives (Manufactured Fireworks)

Manufactured fireworks on the British authorized list are provisionally authorized in Canada.

All fireworks as manufactured by the following Canadian makers are authorized:

Macdonald Metal Products Company Ltd., Waterloo, Que.

Marroni, Berardo, St. Pierre, Que.

Toronto Fireworks Co. Ltd., Islington, Ont.

T. W. Hand Co. Ltd., and Dominion Fireworks Co., Dixie, Ont.

Certain fireworks manufactured by the following foreign makers are authorized:

#### Germany:

Blumberg and Co., Dusseldorf.

Eisfeld, J. F., Silberhutte, Anhalt.

Eckhardt, C. F., Nuernberg.

Fischer, Wilhelm, Wurtemberg.

Geb. Weinrich, Thuringen.

Gerka-Werke, Offenbach on Main.

Hamburg-Bremer Handelgesellschaft, Hamburg.

Nicolaus H. and Co., Memmingen, Thuringen.

Wicke, Fred., Barmen.

#### United States:

American Fireworks Co., Boston, Mass.

Antonelli Fireworks Co., Rochester, N.Y.

Backes, M. Sons Inc., Wallingford, Conn.

Burke and James Inc., Chicago.

Central Railway Signal Co., Boston, Mass.

Continental Fireworks Manufacturing Co., Dunbar, Pa.

Coston Supply Co., New York.

Edmiston Manufacturing Co., Columbus, Ohio.

Edwards Co., Cincinnati.

Essex Specialty Co., Berkeley Heights, N.J.

Federal Buster Corporation, Pittsburgh.

Hitt Fireworks Co. Inc., Seattle.

International Fireworks Co., New York.

International Flare Signal Co., Tippecanoe City, Ohio.

Jedel, A., Newark, Del.

Kilgore Manufacturing Co. Inc., Westerville, Ohio.

Los Angeles Fireworks Co., Los Angeles.

Marshall, John C., Brooklyn, N.Y.

National Fireworks Inc., West Hanover, Mass.

New Jersey Flugent Co., New Brunswick, N.J.

Norman Willets Photo Supply Co., Chicago.

Potts Fireworks Display Co., Franklin Park, Ill.

Rochester Fireworks Co., Rochester, N.Y.

Safety Automatic Toy Co., Dayton, Ohio.

Standard Railway Fuse Corporation, Boonton, N.J.

Unexcelled Manufacturing Co. Inc., New York.

Small Chinese fireworks and Chinese firecrackers with gunpowder composition, and not exceeding 4 inches in length and nine-sixteenth inch in diameter are authorized, when found to function satisfactorily on examination at port of entry.





